Course Title	Course Code	Number of Study Hours				Year	Level	Prerequisites
		Theo.	Lab.	Credit	ECTS			
Plasma Physics	PHYS622	3	-	3	9	1st/ 2nd	2nd/ 3rd	-

Student's workload			
In-class activities	Contact Hours	Self-learning/study	Hours
Lectures	45	Preparation for classes	120
Laboratory	-	Case studies	-
Exams and quizzes	5	Working on lab experiment	-
Lab demo	-	HW/Assignments	16
		Study for exam	56
Total	50	Total	192
Total Learning Hours = 242		Equivalent ECTS points = Total LH/28 = 9	

BRIEF COURSE DESCRIPTION

- This course is designed to cover the advanced topics in plasma physics with a focus on waves in plasma and plasma technology. It discusses connected fundamental physics and up to date knowledge of plasma theory and applications. The course will prepare the students to do research in plasma and nanotechnology areas.

COURSE OBJECTIVES

The main objectives of this course are focused on the following:

1. Discuss the fundament of plasma.
2. Investigate the Fluid model and waves in plasma.
3. Discuss the fundamentals and principles operation of plasma sources and selected diagnostics.
4. Examine the concept of collision processes, plasma chemistry and plasma dynamics.
5. Investigate fundamental interactions of particles in the plasma with the surface.
6. Outline the Plasma applications.

COURSE CONTENTS

- Review of plasma fundamentals: Plasma parameters, Plasma criteria, Debye shielding, Collective behavior, Quasi-neutrality, Degree of ionization, and Electron temperature, Basic plasma Equations and equilibrium, Plasma Collisions.
- Fluid model of plasma, Waves in plasma, Waves in plasma for constant electric and/or magnetic field, Waves in plasma for space and/or time variable electric and/or magnetic field.
- Plasma Sources: Electric breakdown, DC plasma sheaths, DC and RF discharges, Capacitive coupled plasma discharges, Inductive coupled plasma discharges, High Pressure Plasma Sources.
- Plasma Chemistry and Surface Interactions: Plasma collisions, Plasma dynamics, Plasma chemistry, Plasma surface interactions.
- Plasma applications: Plasma etching, Plasma enhanced chemical vapor deposition (PECVD), Plasma implantation, Plasma polymerization, Plasma catalysis.

ASSESSMENT CRITERIA

- Mid-Term exam and Quizzes: 30 %
- Assignments and classroom activities: 20 %
- Final Exam: 50%

COURSE TEACHING STRATEGIES

- Lectures, blackboard and visualization, brainstorming, Interactive illustration – Problem based learning, Interactive and Group discussion, expository and discovery teaching.

TEXT BOOK

- M. A. Lieberman and A. J. Lichtenberg, Principles of Plasma Discharges and Materials Processing, 2nd edition, (Wiley Interscience 2005).

REFERENCE BOOKS

- F. F. Chen Introduction to Plasma Physics and controlled Fusion, 3rd Edition Springer (2015)
- T. Makabe, and Z. L. Petrovic; Plasma Electronics: Applications in Microelectronic Device Fabrication, (Taylor & Francis 2006).
- P. Chabert and N .Braithwaite, Physics of Radio-Frequency Plasmas, (Cambridge University Press 2011).
- Fridman and L. A. Kennedy, Plasma Physics and Engineering, 2nd edition (Taylor &Francis 2011)